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CURRENT NACA REPORTS

NACA TN 2449

INVESTIGATION OF INFLUENCE OF CHEMICAL COMPOSITION ON FORGED MODIFIED LOW-CARBON N-155 ALLOYS IN SOLUTION-TREATED AND AGED CONDITION AS RELATED TO RUPTURE PROPERTIES AT 1200° F. E. E. Reynolds, J. W. Freeman and A. E. White, University of Michigan. September 1951. 111p. diagrs., photos., 11 tabs. (NACA TN 2449)

Use of careful control over processing conditions in this investigation has shown that it is possible to correlate stress-rupture properties of forged alloys of the low-carbon N-155 alloy type at 1200° F with systematic variations in chemical composition and that a wide range in properties can be obtained by such variations. However, no alloy was obtained which had properties which were outstanding compared with those of the standard basic analysis of low-carbon N-155 alloy.

NACA TN 2466

A GENERAL CORRELATION OF TEMPERATURE PROFILES DOWNSTREAM OF A HEATED AIR JET DIRECTED PERPENDICULARLY TO AN AIR STREAM. Edmund E. Callaghan and Robert S. Ruggeri. September 1951. 37p. diagrs. (NACA TN 2466)

An experimental investigation was conducted to determine the temperature profile downstream of a heated air jet directed perpendicularly to an air stream. The profiles were determined at several positions downstream of the jet as a function of jet density, free-stream density, jet velocity, jet temperature, free-stream velocity, and orifice flow coefficient. A method is presented which yields a good approximation of the temperature profile in terms of dimensionless parameters of the flow and geometric conditions.

NACA TN 2487

EFFECT OF GROUND INTERFERENCE ON THE AERODYNAMIC CHARACTERISTICS OF A 42° SWEPTBACK WING. G. Chester Furlong and Thomas V. Bollech. October 1951. 24p. diagrs., photos. (NACA TN 2487. Formerly RM L8F04)

The effects of ground interference on the aerodynamic characteristics of a 42° sweptback wing have been determined at distances above the ground 0.68 and 0.92 of the mean aerodynamic chord (measured from the 0.25 mean aerodynamic chord). The wing was tested without flaps and with inboard trailing-edge split and outboard leading-edge flaps deflected. The wing had an aspect ratio of 4, a taper ratio of 0.625, and NACA 64_1-112 airfoil sections perpendicular to the 0.273 chord line. The results are, in general, comparable to those reported for unswept wings. The longitudinal stability at the stall was not materially affected at the ground heights of the present tests.

NACA TN 2492

A METHOD OF SOLVING THE DIRECT AND INVERSE PROBLEM OF SUPERSONIC FLOW ALONG ARBITRARY STREAM FILAMENTS OF REVOLUTION IN TURBOMACHINES. Chung-Hua Wu and Eleanor L. Costilow. September 1951. 25p. diagrs. (NACA TN 2492)

A method is presented for the determination of the supersonic flow past arbitrary turbomachine blades along stream surfaces of revolution and for the design of these blades for a prescribed velocity or turning distribution around the blades. The shapes of the stream surfaces are arbitrary. The method takes into account the variable distance between adjacent stream surfaces.

NACA TN 2494

LIFT AND MOMENT ON OSCILLATING TRIANGULAR AND RELATED WINGS WITH SUPERSONIC EDGES. Herbert C. Nelson. September 1951. 34p. diagrs. (NACA TN 2494)

The linearized velocity potential for a thin, flat, tri-triangular or related wing with supersonic edges, undergoing harmonic torsional oscillations and vertical translations in a constant supersonic stream, is derived in terms of a frequency parameter. Closed expressions for the velocity potential, section force and moment coefficients for the triangular wing are developed to the third power of the frequency of oscillation.

NACA TN 2497

GENERALIZED CONICAL-FLOW FIELDS IN SUPERSONIC WING THEORY. Harvard Lomax and Max. A. Heaslet. September 1951. 45p. diagrs. (NACA TN 2497)

Linearized, compressible-flow analysis is applied to the study of quasi-conical supersonic wing theory. Single-integral equations are derived which relate either the loading to the shape of a lifting surface or the thickness of a symmetrical wing to the pressure distribution for triangular wings with subsonic lead-

ing edges. The forms of these equations and their inversions are simplified through the introduction of the finite part and the generalized principal part of an integral. Applications of the theory, in the lifting case, include previously known results. In the nonlifting case, it is shown that for a specified pressure distribution the theory does not always predict a unique thickness distribution. This is demonstrated for a triangular plan form having a constant pressure gradient in the stream direction.

NACA TN 2498

FLIGHT INVESTIGATION OF THE EFFECT OF ATMOSPHERIC TURBULENCE ON THE CLIMB PERFORMANCE OF AN AIRPLANE. Harry Press and Herbert C. McClanahan, Jr. October 1951. 30p. diagrs., 5 tabs. (NACA TN 2498)

The results of an investigation consisting of a series of one-engine climb tests with a twin-engine transport airplane indicate that light turbulence of the type generally present in clear air over flat terrain has no significant effect on the average rate of climb for a series of runs. Turbulence does, however, increase the variation in the rate of climb from run to run. The standard deviation of the rate of climb attributable to turbulence decreases rapidly when the climb duration is increased from 1 to 5 minutes.

NACA TN 2500

A COMPARISON OF THE TURBULENT BOUNDARY-LAYER GROWTH ON AN UNSWEPT AND A SWEPT WING. John M. Altman and Nora-Lee F. Hayter. September 1951. 30p. diagrs., photos. (NACA TN 2500)

Turbulent boundary-layer measurements are presented for a 45° swept and a two-dimensional unswept wing. A comparison is made of the displacement thickness, the momentum thickness, and the shape parameters for the two wings based on the component of velocity normal to the leading edge. The tests were conducted at a Reynolds number of about 4 million based on the component of velocity normal to the leading edge.

NACA TN 2501

EXPRESSIONS FOR MEASURING THE ACCURACY OF APPROXIMATE SOLUTIONS TO COMPRESSIBLE FLOW THROUGH CASCADES OF BLADES WITH EXAMPLES OF USE. John T. Sinnette, Jr., George R. Costello and Robert L. Cummings. October 1951. 33p. diagrs. (NACA TN 2501)

Four necessary conditions for steady irrotational compressible flow through a straight cascade of blades are derived from the irrotationality condition and the conservation of mass and momentum, and these conditions are used to obtain expressions for measuring the accuracy of approximate compressible flow solutions. Application to typical compressor cascades indicated that an approximation based on linear relation between pressure and specific volume is considerably more accurate than the incompressible approximation or the Prandtl-Glauert approximation.

NACA TN 2502

EXAMPLES OF THREE REPRESENTATIVE TYPES OF AIRFOIL-SECTION STALL AT LOW SPEED. George B. McCullough and Donald E. Gault. September 1951. 52p. diagrs., photo., 6 tabs. (NACA TN 2502)

A summary of airfoil-section stalling characteristics, based on experimental investigations of five airfoil sections, is presented. Section stalling characteristics of three types are considered and are designated: trailing-edge stall, leading-edge stall, and thin-airfoil stall. The corresponding boundary-layer flows are discussed, and illustrative examples of the force, moment, pressure-distribution, and boundary-layer characteristics of each type are furnished.

NACA RM A51G09

SCHLIEREN INVESTIGATION OF THE WING SHOCK-WAVE BOUNDARY-LAYER INTERACTION IN FLIGHT. George E. Cooper and Richard S. Bray. September 1951. 26p. diagrs., photos. (NACA RM A51G09)

Schlieren photographs obtained in flight of the shock-wave interaction with a thick turbulent boundary layer on a wing are presented together with measured boundary-layer characteristics. Good correlation with theoretical and wind-tunnel investigations of boundary-layer shock-wave interaction was obtained, particularly with respect to the lower Mach number for the establishment of a forked or bifurcated type of shock wave.

NACA RM E51G20

PRELIMINARY RESULTS OF A DETERMINATION OF TEMPERATURES OF FLAMES BY MEANS OF K-BAND MICROWAVE ATTENUATION. Leonard Rudlin. September 1951. 20p. diagrs. (NACA RM E51G20)

The temperature effects on the attenuation of K-band microwaves, at a frequency of 26,500±30 megacycles per second, through natural-gas and propane flames containing added alkali halide salts, were investigated over a temperature range from 1900° to 2500° K. The preliminary data of this investigation indicated that the attenuation varies appreciably with the sodium-line-reversal temperatures of the flames and is independent of the particular hydrocarbon fuels that were used for temperature sources and of the particular halide components of the compounds used, in the concentrations employed to produce easily measurable attenuation. A reproducibility of ±25° K was obtainable.

NACA RM E51G24

RESOLUTION OF ANNEALING EXPERIMENTS FOR THE STUDY OF NONEQUILIBRIUM STATES. Philip Schwed. September 1951. 15p. diagrs. (NACA RM E51G24)

The two techniques for conducting annealing experiments for the purpose of determining the distribution of atoms of a solid among nonequilibrium states are

considered. Related definitions for resolving power for annealing with steadily rising temperature and for annealing at a series of fixed temperatures are given. The necessary separation of activation energies for the resolution of two different nonequilibrium states is found to be greater in the case of a steadily rising temperature, but of the order of 10 percent of the activation energy for both techniques. The resolving power in the case of a steadily rising temperature is independent of the rate of temperature rise.

NACA TM 1277

PRESENT STATE OF DEVELOPMENT IN NON-STEADY MOTION OF A LIFTING SURFACE. (Lo stato attuale delle ricerche sul moto instazionario di una superficie portante). P. Cicala. October 1951. 96p. diagrs., 3 tabs. (NACA TM 1277. Trans. from Aerotecnica, v.21, no.9-10, Sept.-Oct.1941, p.557-591, 670-685, 759-773).

A summary is given of the principal results on air forces for a wing undergoing unsteady motion in an incompressible fluid and of methods followed by various investigators, as of 1941. Part I contains results for a wing of infinite aspect ratio; part II deals with procedures for wings of finite aspect ratio; part III contains results for force components in the direction of motion (propulsion or drag); part IV considers the results of some experimental investigations. Each part contains an evaluation of existing publications.

NACA TM 1314

ON THE TURBULENT FRICTION LAYER FOR RISING PRESSURE. (Zur turbulenten reibungsschicht bei druckanstieg). K. Wieghardt and W. Tillmann. October 1951. 46p. diagrs. (NACA TM 1314. Trans. from Zentrale für wissenschaftliches Berichtswesen der Luftfahrtforschung, Berlin. UM 6617, November 20, 1944).

Among the information presented are included displacement, momentum, and kinetic energy thicknesses, shearing stress distributions across the boundary layer, and surface friction coefficients. The Gruschwitz method and its modifications are examined and tested. An energy theorem for the turbulent boundary layer is introduced and discussed but does not lead to a method for the prediction of the behavior of the turbulent boundary layer because relations for the shearing stress and the surface friction are lacking.

NACA TM 1315

DISPLACEMENT EFFECT OF THE LAMINAR BOUNDARY LAYER AND THE PRESSURE DRAG. (Verdrängungswirkung der laminaren Grenzschichten und Druckwiderstand). H. Görtler. October 1951. 43p. diagrs., 3 tabs. (NACA TM 1315. Trans. from Ingenieur-Archiv, v.14, 1944, p.286-305).

The displacement effect of the boundary layer on the outer frictionless flow is discussed for both steady and unsteady flows. The analysis is restricted to cases in which the potential flow pressure distribution remains valid for the boundary-layer calculation. Formulas are given for the dependence of the pressure drag, friction drag, and total drag of circular cylinders on the time from the start of motion for cases in which the velocity varies as a power of the time. Formulas for the location and for the time for the appearance of the separation point are given for two dimensional bodies of arbitrary shape.

BRITISH REPORTS

N-10282*

Royal Aircraft Establishment (Gt. Brit.)
A SIMPLE TEST GEAR FOR MEASUREMENT OF EXTINCTION VOLTAGE OF COLD CATHODE DIODES UNDER DYNAMIC CONDITIONS. N. E. G. Hill. May 1951. 8p. diagrs., 3 tabs. (RAE Tech. Note EL.21)

Describes a test gear developed to enable extinction voltage data to be collected on cold cathode diodes under operating conditions. The test gear is a simple variant of the striking voltage test gear which has been described in an earlier report. It enables the striking and extinction voltages of a diode to be measured simultaneously to the nearest 1 volt.

N-10286*

Royal Aircraft Establishment (Gt. Brit.)
PHOTOGRAPHIC LENS TESTING. R. W. Fish. March 1951. 31p. diagrs., photos. (RAE Tech. Note Ph.443)

The methods used at present by the Royal Aircraft Establishment for the testing of lenses designed for air photography are given in detail. The apparatus and standard conditions for the measurement of the lens resolving power are described, and the treatment and accuracy of the experimental data discussed. Extension of the resolving power measurements to the focusing of cameras and the estimation of cine-camera performance are briefly described.

N-10288*

Aeroplane and Armament Experimental Establishment (Gt. Brit.) A METHOD OF PERFORMANCE REDUCTION FOR HELICOPTERS. PART 2. STEADY AUTOROTATIVE FLIGHT. A. L. Oliver. June 11, 1951. 10p. diagrs. (AAEE Rept. A.A.E.E./Res/257)

A method of performance reduction for helicopters was given in AFEE Rept. Res. 26, together with charts for the estimation and reduction of performance in power-on flight. The same method has been used here to prepare charts for estimating steady autorotative performance and for determining the effect on rate of descent of changes in temperature, rotor speed, and weight.

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N-10289*

Ministry of Supply (Gt. Brit.)
THE EVALUATION OF PERSPEX JOINTING TECHNIQUES. January 1951. 43p. diagrs., photos., 40 tabs. (MOS S & TM 5/51; Fairey Aviation Co., Ltd., Hayes)

Describes a program of work carried out to afford a comparison of joint strengths in Perspex when the jointing is effected by an acrylic dough and a solvent cement. It was also desired to obtain the relevant design data. Results are given for tension, bend and shear strengths at ambient temperatures, +70°C, and -70°C, for both plasticized and unplasticized Perspex. It has been shown that joints made with an acrylic dough afford higher ultimate strengths than those made with a solvent cement. It is also apparent that various imperfections in the joint produce considerable reduction in joint strength.

N-10306*

National Gas Turbine Establishment (Gt. Brit.)
THE BURNING OF SINGLE DROPS OF FUEL. PART II. EXPERIMENTAL RESULTS. G. A. E. Godsave. April 1951. 19p. photos., diagrs., 3 tabs. (NGTE R.87)

This is Part II in the series of reports describing investigations of the mechanism of the combustion of the individual drops in a liquid fuel spray. This report gives results of experimental measurements of the burning rates of single drops of various fuels suspended in still air on a fine silica filament. Over the range of drop diameter investigation (2,000-1,000μ), the burning drops decreased in size at a mass rate proportional to the first power of their diameters. The burning rate at any diameter, and hence the total drop life, may be characterized by a constant λ called the evaporation constant. Using the experimental technique described in this report, it was possible to determine the values of the evaporation constant λ for a series of pure hydrocarbons and commercial fuels.

N-10359*

Royal Aircraft Establishment (Gt. Brit.)
ON THE ERRORS INVOLVED IN MEASURING SUPERSONIC MACH NUMBERS. W. T. Lord and D. Beastall. April 1951. 43p. diagrs., tab. (RAE Aero 2100)

This note presents a method of finding the errors to be expected in deriving the Mach number at a point in a supersonic flow from the formulas which depend on the pitot, static, and stagnation pressures at that point, when the errors involved in the pressure readings can be estimated. It thus suggests the best formula to use in any given case. The method is illustrated by a series of figures covering values of Mach number from 1 to 4, when no pressure has an error more than four times greater than that of any other. Other cases may be computed as required.

N-10379*

Forest Products Research Lab. (Gt. Brit.)
TRIALS OF TIMBERS FOR PLYWOOD MANUFACTURE. PRELIMINARY TESTS ON FIVE SPECIES. PROGRESS REPORT TWELVE. June 1951. 27p. 15 tabs. (Forest Products Research Lab.)

Small quantities of African timbers were tested as specified in Paper PRP5/1 - Manual for Conducting Trials of Timbers for Plywood Manufacture. The timbers were Afzelia, Danta, Greenheart, Mubura, and Muhimbi.

N-10380*

Forest Products Research Lab. (Gt. Brit.)
INVESTIGATIONS INTO GLUES AND GLUING. PROGRESS REPORT SIXTY-TWO - MAY, 1951. THE COMPARATIVE DURABILITY OF PLYWOOD GLUES IN ENGLAND AND IN NIGERIA. (SERIES IV). J. F. S. Carruthers and A. M. Thomas. 11p. photos., 3 tabs. (Forest Products Research Lab.)

The glues tested include those of the phenol, resorcinol, melamine, and fortified and normal urea formaldehyde types. Beech and gaboon plywood was made with 10 glues. The panels were exposed in two environments at Princes Risborough (panels open-piled in a normally heated workshop and fully exposed on nearly horizontal racks in the open) and in two at Port Harcourt, Nigeria (panels piled in stick under an open sided shed and fully exposed on nearly horizontal racks in the open).

UNPUBLISHED PAPERS

N-8588*

National Bureau of Standards.
CORROSION OF SURFACE TREATED ALUMINUM ALLOYS. Fred M. Reinhart. 1951. 9p. diagrs., 2 tabs. (National Bureau of Standards. Rept. 1004)

Panels of aluminum alloy 24S-T3, surface-treated by the Alrok 14 and Bonderite 170 processes, were exposed in a salt fog cabinet, tidewater and marine atmosphere, both unpainted and painted, to evaluate their protective merits in these environments. The unpainted Alrok 14 surface-treated material was more resistant to corrosive attack in the tidewater and marine atmosphere than was the Bonderite 170 treated material. The Alrok 14 treated material was susceptible to the pitting type of corrosive attack only while the Bonderite 170 treated material was susceptible to intergranular attack. Both surface treatments were good bases for paint coatings in both environments for 24 months.